CLAIMS

1. Method for controlling additions of powder materials into an electrolytic cell (1) designed for the production of aluminium by fused bath electrolysis and provided with at least one powder material distributor (20) and at least one boring device (30) comprising an actuator (31) and a crustbreaker (33), the said cell containing a liquid electrolyte bath (7) and being operated such that an alumina and solidified bath crust (10) is formed above the liquid electrolyte bath (7), method in which at least one opening (11) is formed in the said crust (10) using the boring device (30) and powder material is added through at least one opening (11) using a determined procedure for introducing additions in the bath, referred to by the expression "normal feed procedure", and characterized in that:

- at a determined time t_0, an electrical signal S is generated to provoke lowering of the crustbreaker (33) using the actuator (31),
- the moment t at which the crustbreaker (33) reaches a predetermined low position P is measured,
- the value of at least one powder material feed operation indicator is determined, using a function $F(t_0, t)$,
- at least one operation criterion and the value of the operation indicator(s) F are used to determine whether or not operation is abnormal,
- if the operation is not considered to be abnormal, the normal feed procedure is maintained,
- if operation is considered to be abnormal, at least one correction procedure called a "regularisation / normalisation" procedure is triggered, that can restore normal operation of the powder material feed.

2. Control method according to claim 1, characterised in that an operation indicator is given by a difference function $F(t-t_0)$, called the "descent duration" D between time t_0 and time t.

3. Control method according to claim 2, characterised in that operation is considered to be abnormal if the descent duration D is higher than a determined high threshold Sh, in at least Nh successive determinations.

4. Control method according to claim 3, characterised in that Nh is an integer number between 1 and 10 inclusively.

5. Control method according to any one of claims 2 to 4, characterised in that operation is considered to be abnormal if the descent duration is longer than a determined threshold Sh' determined in at least Nh' determinations out of N, in other words if the ratio Nh'/N is more than a given value Rh.

6. Control method according to any one of claims 3 to 5, characterised in that the thresholds Sh and Sh' are equal to a fixed value or a value calculated using several values for the duration D, that are successive or separated by intermediate values.

7. Control method according to any one of claims 2 to 6, characterised in that operation is considered to be abnormal if the descent duration is less than a determined low threshold Sb in at least Nb successive determinations.

8. Control method according to claim 7, characterised in that Nb is an integer number between 1 and 10 inclusively.

9. Control method according to any one of claims 1 to 8, characterised in that operation is considered to be abnormal if the time t cannot be measured after a time T exceeding a maximum determined threshold Tmax.

10. Control method according to claim 9, characterised in that the threshold Tmax is between 5 and 15 seconds.

11. Control method according to any one of claims 1 to 10, characterised in that an operation indicator, called the drift indicator, is determined from a deviation E between at least two values of the duration D, either successive or separated by intermediate values.

12. Control method according to claim 11, characterised in that the said deviation E is given by the algebraic difference between two successive values of the duration D or two values separated by intermediate values.

13. Control method according to claim 11, characterised in that the said deviation E is given by a mean deviation or a statistical deviation between at least three successive values of the duration D, or three values separated by intermediate values.

14. Control method according to any one of claims 11 to 13, characterised in that operation is considered to be abnormal when the said deviation E is greater than a determined threshold Se.

15. Control method according to any one of claims 1 to 14, characterised in that the said regularisation / normalisation procedure comprises at least one automatic or manual action to correct operation of the boring device (30).

16. Control method according to any one of claims 1 to 15, characterised in that the cell (1) comprises at least two boring devices (30) each associated with a distinct powder material distributor (20) and in that the regularisation / normalisation procedure includes an at least temporary interruption of the feed by the distributor associated with the boring device for which operation is considered to be abnormal.

17. Control method according to claim 16, characterised in that it comprises distributing the feed of powder material on the other distributor(s) in the cell.

18. Control method according to any one of claims 1 to 17, characterised in that when operation of at least one boring device (30) is considered to be abnormal, the control method also comprises a modification of the normal feed procedure.

19. Control method according to any one of claims 1 to 18, characterised in that the determined low position is the position at which the crustbreaker (33) comes into contact with the liquid electrolyte bath (7).

20. Control method according to any one of claims 1 to 18, characterised in that the determined low position is the lowest position allowed by the actuator (31).

21. Control method according to any one of claims 1 to 20, characterised in that the boring device or each boring device (30) comprises at least one position detector (40) capable of detecting the said low position.

22. Control method according to claim 21, characterised in that the boring device or each boring device (30) comprises at least one jack fitted with the said position detector (40).

23. Control method according to claim 22, characterised in that the said detector (40) is a stroke end detector.

24. Control method according to any one of claims 21 to 23, characterised in that the position detector (40) is chosen from among mechanical, electrical, optical or magnetic detectors, and detectors comprising any combination of these means.

25. Control method according to any one of claims 1 to 24, characterised in that the electrical signal S transmits the crustbreaker lowering order electrically, optically, or pneumatically.

26. Control method according to any one of claims 1 to 25, characterised in that powder materials are chosen from among the group including alumina based powders, aluminium fluoride powders or cryolite based powders.

27. System (50) for controlling additions of powder materials into an electrolytic cell (1) designed for the production of aluminium by fused bath electrolysis and provided with at least one powder material distributor (20) and at least one boring device (30) comprising an actuator (31) and a crustbreaker (33), the said cell containing a liquid electrolyte bath (7) and being operated so as to form an alumina and solidified bath crust (10) above the liquid electrolyte bath (7), characterized in that it comprises:

- a means (51) of generating an electrical signal S capable of causing the crustbreaker (33) to be lowered by means of the actuator (31) at a determined time t_0,
- a device (52) for measuring the moment t at which the crustbreaker (33) reaches a determined low position P,
- a means (53) called a diagnostic means of determining the value of at least one feed operation indicator $F(t_0, t)$ starting from the value of the time t_0 and the value obtained for the time t.

28. Control system (50) according to claim 27, characterised in that the measurement device (52) comprises at least one position detector (40) capable of detecting the said low position P.

29. Control system (50) according to claim 28, characterised in that the said detector (40) is integrated into the boring device(s) (30).

30. Control system (50) according to claim 29, characterised in that the said detector (40) is integrated into the said actuator (31) in each boring device (30).

31. Control system (50) according to claim 30, characterised in that the actuator (31) comprises a jack fitted with the said detector (40).

32. Control system (50) according to any one of claims 28 to 31, characterised in that the said detector (40) is a stroke end detector.

33. Control system (50) according to any one of claims 28 to 32, characterised in that the detector (40) is chosen from among mechanical, electrical, optical or magnetic detectors, and detectors comprising any combination of these means.

34. Control system (50) according to any one of claims 27 to 33, characterised in that the control system (50) according to the invention comprises a regulator (54).

35. Control system (50) according to any claim 34, characterised in that the regulator (54) comprises specific means of implementing the automatic actions intended to correct operation of a boring device (30) when an operation indicator $F(t_0, t)$ reveals abnormal operation of the feed.

36. Control system (50) according to any one of claims 27 to 35, characterised in that powder materials are chosen from among the group including alumina based powders, aluminium fluoride powders or cryolite based powders.